

Design Development Analyses in Support of a Heatpipe-Brayton Cycle Heat Exchanger

Brian Steeve¹, Melissa Van Dyke¹, Alok Majumdar¹, Dalton Nguyen¹,
Melissa Corley³, Ray M. Guffee², Richard J. Kapernick²

¹NASA Marshall Space Flight Center, Huntsville, AL 35812

²Los Alamos National Laboratory, Los Alamos, NM 87545

³Mechanical Engineering, Stanford University, Stanford, CA 94309

Abstract. One of the power systems under consideration for nuclear electric propulsion or as a planetary surface power source is a heatpipe-cooled reactor coupled to a Brayton cycle. In this system, power is transferred from the heatpipes to the Brayton gas via a heat exchanger attached to the heatpipes. This paper discusses the fluid, thermal and structural analyses that were performed in support of the design of the heat exchanger to be tested in the SAFE-100 experimental program at Marshall Space Flight Center. A companion paper, "Mechanical Design and Fabrication of a SAFE-100 Heat Exchanger for use in NASA's Advanced Propulsion Thermal-hydraulic Simulator", presents the fabrication issues and prototyping studies that, together with these analyses, led to the development of this heat exchanger. An important consideration throughout the design development of the heat exchanger was its capability to be utilized for higher power and temperature applications. This paper also discusses this aspect of the design and presents designs for specific applications that are under consideration.

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